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| 10/635,404 | 08/06/2003 | Johnny Chung Lee | MERL-1491 | 8478 |

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Patent Department
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| EXAMINER | |
|---|---|
| KOVAL, MELISSA J | |
| **ART UNIT** | **PAPER NUMBER** |
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Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/635,404 | LEE ET AL. | |
| | Examiner | Art Unit | |
| | Melissa J. Koval | 2851 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *03 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *3,13,16,21,24 and 25* is/are allowed.

6)☒ Claim(s) *1,2,4-12,14,15,17-20,22,23 and 26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *June 3, 2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 4-11, 14, 15, 17-20, 22, 23, and 26 are rejected under 35 U.S.C. 102(e) as being anticipated by Surati et al. U.S. Patent 6,456,339 B1.

Claim 1 sets forth: "A method for determining correspondence between locations on a display surface having an arbitrary shape and pixels in an output image of a projector, comprising (See the SUMMARY OF THE INVENTION, particularly column 6, lines 26 through 46, and column 7, lines 14 and 15. Method steps are shown in the flowcharts of Figures 4A, 4B, 5, 6 and 7, for example.):

projecting a set of known calibration patterns onto the display surface (See column 7, lines 10 through 13. See column 8, lines 52 through 64. See column 11, lines 4 through 25.);

sensing directly an intensity of light at each of a plurality of locations on the display surface for each calibration pattern, there being one discrete optical sensor

associated with each location; and correlating the intensities at the locations to determine correspondences between the plurality of locations and pixels in an output image of the projector (See column 7, lines 1 through 9. See column 21, lines 49 through 67, and column 22, lines 1 through 14. Furthermore, in the discussion of "Warping the Image to be Positionally Seamless" beginning in column 15, line 5, and ending in column 16, line 17, a discussion of mapping with discrete input and output values and discrete sampling is given.)."

Claim 2 sets forth: "The method of claim 1, in which each location has known coordinates (See column 15, lines 6 through 45.)."

Claim 4 sets forth: "The method of claim 1, in which the correspondences are used to determine parameters of the projector." See column 11, lines 4 through 25, and column 13, lines 42 through 67, as examples.

Claim 5 sets forth: "The method of claim 4, in which the parameters include internal and external parameters and non-linear distortions of the projector." Again refer to column 11, lines 4 through 25.

Claim 6 sets forth: "The method of claim 1, further comprising:

warping an input image to the projector according to the correspondences; and

projecting the warped input image on the display surface to appear undistorted ." See column 11, lines 36 through 42.

Claim 7 sets forth: "The method of claim 1, in which the projector is casually aligned with the planar display surface." See Figure 1 and any of projectors $P_1$ through $P_4$.

With respect to claims 8 and 9, refer to column 7, lines 14 and 15.

Claim 10 sets forth: "The method of claim 1, in which a viewer and the projector are on a same side of the display surface." Column 22, lines 21 through 29.

Claim 11 sets forth: "The method of claim 8, in which the display surface is planar and a number of locations is four." See Figure 10 and column 15, lines 57 through 65.

Claim 14 sets forth: "The method of claim 1, in which the intensity is quantized to zero or one." See the term "discrete output values" in column 15, lines 54 and 55, for example. Also see Figure 6.

Claim 15 is rejected for the same reasons already applied to rejected claim 6. Also see column 10, lines 56 through 67, and column 11, lines 1 through 3.

Claims 17 and 18 are met by the teaching of column 7, lines 14 and 15.

Claim 19 sets forth: "The method of claim 1, in which the light is infrared." See column 7, lines 1 and 3, and column 13, lines 55 through 60.

Claim 20 sets forth: "The method of claim 1, in which each calibration image is projected as a pair, a second image of the pair being an inverse of the calibration image." See Figures 11A and 11C. See column 15, lines 33 through 45. See column 16, lines 19 through 55.

Claim 22 is rejected for the same reasons already applied to rejected claims 1and 6.

Claims 23 and 26 are rejected for the same reasons applied to already rejected claim 1.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Surati et al. U.S. Patent 6,456,339 B1.

Surati et al. '339 B1 teaches all of the elements of claim 12, except that Surati et al. '339 B1 do not say specifically what type of components comprise the sensors which are used for the optical sensors comprising their super-resolution display. However, throughout the specification of '339 B1, it is made clear that a variety of optical sensors maybe be used in various embodiments taught therein. The type of optical sensor used does not distinguish the invention over the prior art of record. Applicant does not teach in his specification the criticality of using a photo transistor over another type of sensor and the results of using one optical sensor in place of another are not unexpected.

Transistors, by definition, may carry a voltage that can hold a discrete value.

Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use an optical sensor that can sense visible light such as a photo transistor. The motivation for one having ordinary skill in the art to make such a selection would be the use of an optical sensor compatible with discrete intensities.

### *Allowable Subject Matter*

Claims 3, 13, 16, 21, 24 and 25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### *Response to Arguments*

Applicant's arguments filed June 3, 2005 have been fully considered but they are not persuasive. For applicant's convenience, the rejections of the claims, as set forth in the Office Action of February 3, 2005 are repeated above.

Applicant's remarks on the bottom of page 2 with regard to the rejection of claims 1, 2, 4-11,14,15,17-20, 22, 23 and 26 under 35 USC 102(e) as being anticipated by Surati et al. U.S. Patent 6,456,339 B1 are an introduction to his remarks on page 3.

On page 3, lines 1 through 5, of applicant's remarks, applicant states the following: "Surati never measures light intensity produced directly by the projector. Further, Surati maps camera pixels to projector pixels, which has nothing to do with what is claimed. Claimed is directly measuring the intensities of projected calibration images, and correlating the intensities to output images."

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., specifically the following phrases: "measures light intensity produced directly by the projector," and "directly measuring the intensities of projected calibration images, and correlating the intensities to output images".) are not recited in the rejected claims 1, 23

and 26. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Furthermore, applicant's arguments rely on an interpretation of the phrase "sensing directly" as well as the possibility of varying interpretations of the word "direct". The examiner asserts that applicant's interpretation of the phrase "sensing directly" is not correct as applied to the claim language when compared with the reference to Surati et al. '339 B1. Applicant seemingly suggests that the phrase "sensing directly" precludes measuring reflection. The examiner disagrees. Nowhere in the teaching of Surati et al. '339 is an indirect method of sensing or measurement taught. Surati et al. '339 B1 discuss simultaneous sensing, i.e. direct sensing in column 21, lines 57 through 67:

> Alternatively, more sophisticated techniques allow the projection and sensing of multiple pixels simultaneously, particularly after coarse alignment is complete. Sensing small displacements as corrections is done with many pixels simultaneously.

This example teaches away from applicant's assertion of "indirectly sensing".

Applicant, on page 3 of his remarks sets forth the following from column 8, lines 47 through 54 of Surati et al. '339 B1 as an alleged teaching of indirect sensing:

> In a preferred embodiment, a camera 17 monitors the screen 11 during a calibration phase, or during frames stolen from a moving display. A picture of the screen 11 taken by the camera 17 is fed back to a computer 18 which also controls the projectors $P_1$–$P_4$. The computer 18 first calibrates the camera 17 with reference to the screen 11, and then establishes a screen to projector mapping, which is used to distort images before they are sent to the projectors. These

Applicant seems to imply that mapping requires an additional step or an intermediate step in the method taught. However, Surati et al. '339 B1 distinctly describe their method as a two-step or two phase method. See column 11, lines 1 through 10 as follows:

> FIG. 4A is a block diagram illustrating the general scheme 300 of a preferred embodiment of the present invention. There are two phases: a calibration phase 301 in which the camera 309 is calibrated and mappings are determined for a particular setup; and a display phase 303 in which the desired image 319 is displayed on a screen or projection surface.

Furthermore, Figure 4A, for example, distinctly shows a "Calibration Phase" and a "Display Phase" without an intermediate phase or an additional step shown.

At the bottom of page 3, applicant does not make a convincing argument that illustrates any patentable differences between the claimed "a plurality of locations on the display surface for each calibration pattern, there being one discrete optical sensor associated with each location" and the following as taught by Surati et al in column 15, lines 31 through 45:

> Given a spatial transformation, a discrete input image and a discrete means of output, the issue of resampling arises. Two types of resampling that can be used are forward mapping and inverse mapping. The difference stems from the different representation of the mapping functions that each uses. Both methods and their implementations are discussed below. Resampling must be performed because the input represents discrete samples of a continuous input image and the output represents discrete input that is made into a continuous signal by the projection system. The continuous input image is not available. Resampling is a means of interpolating the continuous input image from that discretized input image and then sampling at points in the input image space related to the output projector space by the spatial transformation.

For at least these reasons, the examiner maintains the rejection of claim 1 as applied in the previous office action and reiterated above. And for these reasons, applicant's arguments on page 3 and the top of page 4 are not persuasive.

With respect to applicants arguments regarding the rejection of claim 2, the examiner asserts that applicant's arguments as set forth on page 4 and as follows are capricious: "The Examiner's reference to col. 15 has nothing to do with determining correspondences between a display surface and a projector". Applicant has completely disregarded lines 20 and 21 of column 15 wherein the following is stated: "The mapping function may be represented by relating screen coordinates to projector coordinates." The entire section referenced in the rejection of claim 2, as set forth above, is copied below for Applicant's convenience:

FIG. 8 illustrates the process of warping used to display an input image **101** once the mappings have been established. Digital image warping is essentially an operation that redefines the spatial relationship between points in an image. There are three aspects to digital image warping: the spatial transformation, the resampling method, and anti-aliasing methods. The input image **101** to be displayed is a bitmap which is input to the resampling system **103**. The spatial transformation **105** and antialiasing filter **107** are essentially plug-ins, that is, various spatial transformations may be plugged into block **105**, and various filtering algorithms may be plugged into block **107**. The output **109** of the resampling system **103** is the pixel information which is sent to each projector.

The mapping function may be represented by relating screen coordinates to projector coordinates

$$[x,y]=SP_i=[X(u,v),Y(u,v)], \quad (1)$$

where [x,y] are the output image coordinates of pixels in a projector's space $P_i$ and [u,v] are the input image coordinates of a pixel in image, or screen, space S. Alternatively, the mapping function can be represented by relating projector coordinates to screen coordinates:

$$[u,v]=P_iS=SP_i^{-1}=[U(x,y),V(x,y)]. \quad (2)$$

Given a spatial transformation, a discrete input image and a discrete means of output, the issue of resampling arises. Two types of resampling that can be used are forward mapping and inverse mapping. The difference stems from the different representation of the mapping functions that each uses. Both methods and their implementations are discussed below. Resampling must be performed because the input represents discrete samples of a continuous input image and the output represents discrete input that is made into a continuous signal by the projection system. The continuous input image is not available. Resampling is a means of interpolating the continuous input image from that discretized input image and then sampling at points in the input image space related to the output projector space by the spatial transformation.

Because applicant's refutation of the rejection of claim 2 is incorrect for the reasons already given, his arguments with respect to claims 4, 5 and 6 on page 5 of his remarks cannot be persuasive .

With respect to applicant's arguments against the rejection of claims 7 through 11, applicant simply summarizes the limitations of those claims on page 5 of his remarks, then relies on his arguments against the rejection of claim 1. The examiner is not persuaded and therefore maintains the rejection of claims 7 through 11.

Applicant's arguments against the rejection of dependent claims 7through 11, 14, 15, 17, 18, 19, 20 and 22 under 35 USC 102(e) and the rejection of claim 12 under 35 USC 103 rely on the same erroneous assertions clearly addressed above with respect to the claims from which claims 7 through 12, 14, 15, 17, 18, 19, 20 and 22 depend. To summarize the examiner's position, the invention of Surati et al. does sense light directly, it does show a direct correspondence between a display surface and a projector or projectors by means of a coordinate system, and variations on the shape of the display surface or the location of the display surface with respect to the viewer are taught therein.

For at least these reasons, the examiner maintains the rejection of claims 1, 2, 4 through 12, 14, 15, 17 through 20, 22, 23, and 26 as applied in the previous office action and reiterated above.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

"Merriam-Webster's Collegiate Dictionary, Tenth Edition," copyright 2001, page 327, definitions of the word "direct".

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melissa J Koval whose telephone number is (571) 272-2121. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Nguyen can be reached on (571) 272-2258. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Melissa Jan Koval/
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